

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

To:

see form PCT/ISA/220

PCT

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY (PCT Rule 43bis.1)

Date of mailing
(day/month/year) see form PCT/ISA/210 (second sheet)

Applicant's or agent's file reference
see form PCT/ISA/220

FOR FURTHER ACTION
See paragraph 2 below

International application No.
PCT/CA2004/001075

International filing date (day/month/year)
23.07.2004

Priority date (day/month/year)
25.07.2003

International Patent Classification (IPC) or both national classification and IPC
G01R33/34, G01R33/3415

Applicant
NATIONAL RESEARCH COUNCIL OF CANADA

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☒ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☒ Box No. VII Certain defects in the international application
- ☒ Box No. VIII Certain observations on the international application

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will usually be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA"). However, this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of three months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

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**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.
PCT/CA2004/001075

Box No. I Basis of the opinion

1. With regard to the **language**, this opinion has been established on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.
☐ This opinion has been established on the basis of a translation from the original language into the following language , which is the language of a translation furnished for the purposes of international search (under Rules 12.3 and 23.1(b)).
2. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application and necessary to the claimed invention, this opinion has been established on the basis of:
 - a. type of material:
☐ a sequence listing
☐ table(s) related to the sequence listing
 - b. format of material:
☐ in written format
☐ in computer readable form
 - c. time of filing/furnishing:
☐ contained in the international application as filed.
☐ filed together with the international application in computer readable form.
☐ furnished subsequently to this Authority for the purposes of search.
3. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
4. Additional comments:

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.
PCT/CA2004/001075

Box No. II Priority

1. ☒ The following document has not been furnished:

☒ copy of the earlier application whose priority has been claimed (Rule 43*bis*.1 and 66.7(a)).

☐ translation of the earlier application whose priority has been claimed (Rule 43*bis*.1 and 66.7(b)).

Consequently it has not been possible to consider the validity of the priority claim. This opinion has nevertheless been established on the assumption that the relevant date is the claimed priority date.

2. ☐ This opinion has been established as if no priority had been claimed due to the fact that the priority claim has been found invalid (Rules 43*bis*.1 and 64.1). Thus for the purposes of this opinion, the international filing date indicated above is considered to be the relevant date.

3. Additional observations, if necessary:

Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims	1-11
	No: Claims	
Inventive step (IS)	Yes: Claims	1-11
	No: Claims	
Industrial applicability (IA)	Yes: Claims	1-11
	No: Claims	

2. Citations and explanations

see separate sheet

Box No. VII Certain defects in the international application

The following defects in the form or contents of the international application have been noted:

see separate sheet

Box No. VIII Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

see separate sheet

1. Re Item V: Statement under Rule 43bis.1(a)(i)

1.1 The following documents are referred to in this communication:

D1 : OKAMATO K. ET AL: "Torso Array Coil with Eight QD-Surface Coils for Parallel Imaging" PROCEEDINGS OF THE INTERNATIONAL SOCIETY FOR MAGNETIC RESONANCE IN MEDICINE, TENTH MEETING PROCEEDINGS, 18 May 2002 (2002-05-18), XP002306835 HONOLULU, HI, USA

D2 : FUJITA H., SPENCE D.K.: "A Novel 8-Channel "Saddle-Train" Array Coil for Cardiac SENSE Imaging at 1.5 T" PROCEEDINGS OF THE INTERNATIONAL SOCIETY FOR MAGNETIC RESONANCE IN MEDICINE, TENTH MEETING PROCEEDINGS, 18 May 2002 (2002-05-18), XP002306836 HONOLULU, HI, USA

1.1 Novelty and inventive step (Art. 33(2)(3) PCT) of claims 1-11:

Document D1 can be considered to represent the most relevant state of the art. It discloses (the references in parenthesis applying to this document)

a coil array (Fig. 1) for use in magnetic resonance experiments on a sample to be tested comprising

a plurality of coil elements (see the adjacent rectangular coils) tuned to a common frequency for simultaneous parallel reception of signals from a sample to be tested, the first and second coil elements being placed side by side along a longitudinal direction (z-axis) of the sample to be tested so as to define a line transverse to the longitudinal direction which is at the junction between the first and second coil elements (see the gaps between rectangular coils which are adjacent in the z-direction).

From this, the subject-matter of independent claim 1 differs in that a third coil element is provided having a first, a second and a third coil section, the first coil section being arranged at a location bridging the transverse line, the second coil section being arranged at a side of the first coil section remote from said transverse line and the third coil section being arranged at a side of the first coil section remote from the transverse line and opposite to said second coil section. The second and third coil

sections are twisted relative to the first coil section and arranged such that the current therein rotates in a direction opposite to that of the first coil section. The first coil section provides a depth from the coil of optimum operation equal to the optimum depth of the first and second coil elements.

The subject-matter of claim 1 is therefore novel (Article 33(2) PCT) and the problem to be solved by the present invention may be regarded as how to increase the SNR at the depth of interest, considering that the SNR of the coil arrangement known from D1 is disadvantageously reduced in between the array elements in the long dimension at the transverse line where the junction occurs.

A similar solution is disclosed in document D2 disclosing (the references in parenthesis applying to this document)

a coil array (Fig. 2) for use in magnetic resonance experiments on a sample to be tested comprising

a plurality of coil elements (see the saddle train which can be considered to represent the "third coil element", and the two halves of the central saddle coil, which can be considered to represent the first and second coil elements) tuned to a common frequency for simultaneous parallel reception of signals from a sample to be tested, the first and second coil elements defining a line transverse to its longitudinal direction which is at the junction between the first and second coil elements (see the gap between the two halves),

the coil elements including a third coil element (the saddle train) having a first coil section (central section), a second coil section (left wing of the saddle train) and a third coil section (right wing of the saddle train). The first section bridges the transverse line (see Fig. 2) and the other two sections are arranged at either side of the first section and the current in the second section rotates in a direction opposite to that of the third coil section. Further, decoupling is achieved between the coil elements, see the section "Method" mentioning a geometric decoupling technique.

However, in contrast to D2 the array according to the invention has coil dimensions selected and arranged to provide for the first coil section a depth from the coil of optimum operation within the sample to be tested substantially equal to the predetermined optimum depth of the first and second coil elements. Taking into

account the clarity objections stated below, this is different from D2 because the central section of the saddle train is much longer than the wings of the central saddle coil. This means that although the result attained with the array of D2 is similar to that gained with the array as presently defined, the arrangements are different because the saddle train array of D2 in fact consists of four coils where two loops are separated by a central saddle coil, whereas the basic element of the present invention consists of three parts, wherein one part (namely the third coil element) overlies the other two parts (namely the first and second coil elements, respectively). Further, it appears that the first and second coil elements according to the present invention would have to be arranged such that the respective currents are not counter-rotating as in the butterfly coil of D2, see the objections pursuant to Art. 6 PCT.

It is not apparent that anything could prompt the skilled person to modify the arrangement known from D2 such as to come within the scope of present claim 1.

Concluding, the subject-matter of claim 1 can be considered as involving an inventive step (Art. 33(3) PCT).

Claims 2-11 are dependent on claim 1 and as such also meet the requirements of the PCT with respect to novelty and inventive step.

2. Re item VII: Certain deficiencies in the application

- 2.1 To meet the requirements of Rule 5.1(a)(ii) PCT, the relevant background art disclosed in the documents D1 and D2 should be mentioned in the description, and these documents should be identified therein.
- 2.2 Claim 1 is not in the two-part form in accordance with Rule 6.3(b) PCT, which in the present case would be appropriate, with those features known in combination from the prior art (document D1) being placed in the preamble (Rule 6.3(b)(i) PCT) and with the remaining features being included in the characterising part (Rule 6.3(b)(ii) PCT).
- 2.3 The features of the claims should be provided with reference signs placed in parentheses (Rule 6.2(b) PCT).

3. Re item VIII: Objections pursuant to Art. 6 PCT

- 3.1 Claim 1 defines that the first and second coil elements are placed side by side along a longitudinal direction of the sample to be tested. This definition is obscure because it relates to the envisaged use of the coil array. Since the kind of sample is neither specified nor part of the array, it is not clear what the longitudinal direction is.
- 3.2 Claim 1 defines that the first coil section has "coil dimensions selected and arranged to provide for the first coil section a depth from the coil of optimum operation within the sample to be tested substantially equal to the predetermined depth of the first and second coil elements". This definition is vague because the term "substantially" is indefinite and the reader is left in doubt how to determine the exact coil dimensions. Further, it is not clear how an optimum operation is to be characterised. In view of p. 10, l. 24-26 and in view of a proper delimitation against document D2 (see above) it would appear essential to define that the first coil section matches the dimensions of first and second coil elements, respectively.
- 3.3 It would appear that not any current direction for the first and second coil elements leads to the desired technical effect and it should probably be defined that the first and second coil elements are arranged such that current flows in the same directions in the elements. An arrangement where the currents flow in opposite directions (like in a butterfly coil) would appear to lack support by the description.
- 3.4 The expression "coil element" used throughout the claims is unclear because a coil element could be any part of a coil, e.g., a straight piece of wire or a strip of metal etc. In view of p. 9, l. 22, 23 it should preferably be defined that the elements are loops (which can be of any arbitrary shape).